First Year – Second Semester

Data Communication (BCA-121)

Discipline Core (DC); 4 Credits (3-1-0

Objectives:

At the end of the Subject, the students will be able to build an understanding of the fundamental concepts of data communication and basic taxonomy. Students will gain expertise in some specific areas of networking such as design and maintenance of individual communication networks, which will be helpful to them to work in good oranizations.

S. No.	Topic	No. of Lectures
Unit 1	THE OSI MODEL Physical Layer, Data Link Layer, Network Layer, Transport Layer, Session Layer, Presentation Layer, Application Layer, Summary of Layers	**8**
Unit 2	INTERNETWORKING- Need for Network Layer, IPv4, Datagram, Fragmentation, Checksum, Options, Transition from IPv4 to IPv6	**8**
Unit 3	NETWORK LAYER PROTOCOLS- RIP, OSPF, BGP.	**8**
Unit 4	TRANSPORT LAYERPROCESS-TO-PROCESS DELIVERY, Client/Server Paradigm, Multiplexing and DE multiplexing, Connectionless Versus Connection-Oriented Service, Reliable Versus Unreliable, USER DATAGRAM PROTOCOL (UDP), Well-Known Ports for UDP, User Datagram, Checksum, UDP Operation, Use of UDP, TCP, TCP Services, TCP Features,Segment, A TCP Connection, Flow Control, Error Control, Congestion Control	**8**
Unit 5	INTERNETWORKING- Need for Network Layer, IPv4, Datagram, Fragmentation, Checksum, Options, Transition from IPv4 to IPv6	**8**
		40

TEXT BOOKS:

Data Communications and Networking by Forouzan fifth edition.

Discrete Mathematics and Automata Theory (BCA-122)

Discipline Core (DC); 4 Credits (3-1-0)

S. No.	Topc	No. of Lectures
Unit 1	Sets, Relations, Properties of Relation, Equivalence of Relation, Function, Composite Functions, fog function, gof function, One to One mapping. One to many mapping, many to many mapping, Number, Induction, Mathematical Induction, Variants of Inductions.	**12**
Unit 2	Graph, Walk in Graph, Path in Graph, Euler Graph, Hamiltonian graph, Complete Graph, Null Graph, Incidence Matrix, Adjacency Matrix, Spanning Tree, Chromatic Number, Coloring of Graph, Cyclomatic Number.	**12**
Unit 3	Introduction; Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equi valence of NFA and DFA, Minimization of Finite Automata,	**12**
Unit 4	Regular expression (RE) , Definition, Operators of regular expression and their precedence,Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, , Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA	**12**
		48

TEXT BOOKS:

1. Liu and Mohapatra, "Elements of Discrete Mathematics", McGraw Hill
2. Jean Paul Trembley, R Manohar, Discrete Mathematical Structures with Application to Computer Science, McGraw-Hill
3. Y. N. Singh, "Discrete Mathematical Structures", Wiley India, New Delhi, First Edition, August 2010.
4. R.P. Grimaldi, Discrete and Combinatorial Mathematics, Addison Wesley,
5. B. Kolman, R.C. Busby, and S.C. Ross, Discrete Mathematical Structures, PHI Learning Private Limited, Delhi India.
6. Biswal ,"Discrete Mathematics and Graph Theory, PHI Learning Private Limited, Delhi India.
7. Hopcroft, Ullman, "Introduction to Automata Theory,Languages and Computation", Pearson Education .

Data Structure using 'C' (BCA-123)

Discipline Core (DC); 4 Credits (3-0-2)

Objectives:

1. The objective of this course is to teach students various data structures and to explain them algorithms for performing various operations on these data structures.

Unit	Contents	No. of Lectures
Unit 1	**Introduction:** Basic Terminology, Elementary Data Organization, Structure operations, Algorithm Complexity and Time-Space trade-off.	**5**
Unit 2	**Arrays and Stacks:** Array Definition, Representation and Analysis, Single and Multidimensional Arrays, address calculation, application of arrays, Character String in C, Character string operation. Stacks: Array Representation and Implementation of stack, Operations on Stacks: Push and Pop, Array Representation of Stack, Linked	**8**

	Representation of Stack, Operations Associated with Stacks	
Unit 3	**Queues and Linked Lists:** Array and linked representation and implementation of queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, D-queues and Priority Queues. Linked list: Representation and Implementation of Singly Linked Lists, Two-way Header List, Traversing and Searching of Linked List, Overflow and Underflow, Insertion and deletion to/from Linked Lists, Insertion and deletion Algorithms.	**12**
Unit 4	**Binary Trees, Searching and Hashing:** Representation, Operations: Insert, Delete, Traversal: Preorder, Inorder, Postorder. Searching and Hashing: Sequential search, binary search, comparison and analysis, Hash Table, Hash Functions, Collision Resolution Strategies	**8**
Unit 5	**Sorting, Binary Search Trees:** Sorting: Insertion Sort, Bubble Sorting, Quick Sort, Merge Sort, Heap Sort, Sorting on Different Keys. Binary Search Trees: Binary Search Tree (BST)	**8**
Unit 6	**Graphs:** Representation and Traversal, Representation: Matrix, Adjacency List, And Traversal: Depth First Search, Breadth First Search.	**4**
		45

Reference/Text Books

1. Horowitz and Sahani, "Fundamentals of data Structures", Galgotia Publication Pvt. Ltd., New Delhi.
2. M. Tenenbaum, "Data Structures using C and C++", Prentice-Hall of India Pvt. Ltd., New Delhi.
3. Schaum's Outlines Data structure Seymour Lipschutz Tata McGraw Hill 2nd Edition

Database management System (BCA-124)

Discipline Core (DC); 4 Credits (3-0-2)

Objectives:

1. To understand difference between storing data in FMS and DBMS and advantages of DBMS.
2. To understand conceptual and physical design of a database.
3. To understand RDBMS and queries to design database and manipulate data in it.
4. To know basic database backup and recovery

Unit	Contents	No. of Lectures
Unit 1	**Database Management System:** Introduction, Definition of DBMS, File processing system Vs DBMS, Limitation of file processing system, Comparison of File processing system and DBMS, Advantages and Disadvantages of DBMS, Users of DBMS - Database Designers, Application programmers, Sophisticated Users, End Users, Capabilities of good DBMS, Overall System structure	**6**
Unit 2	**Data Models:** Introduction, Data Models, Object Based Logical Model, Record Base Logical Model - a. Relational Model, b. Network Model, c. Hierarchical Model, Entity Relationship Model, Entity Set, Attribute, Relationship Set, Entity Relationship Diagram (ERD), Extended features of ERD	**8**
Unit 3	**Relational Databases:** Introduction, Terms - a. Relation, b. Tuple, c. Attribute, d. Cardinality, e. Degree, f. Domain, Keys - Super Key, Candidate Key, Primary Key, Foreign Key - Relational Algebra, Operations - a. Select, b. Project, c. Union, d. Difference, e. Intersection, f. Cartesian Product, g. Natural Join	**9**
Unit 4	**Relational Database Design:** Introduction, Anomalies of un normalized database, Normalization - Normal Form, 1NF, 2 NF, 3 NF.	**10**
Unit 5	**SQL (Structured Query Language):** Introduction, History Of SQL, Basic Structure, DDL Commands, DML Commands,	**11**

	Simple Queries, Nested Queries, Aggregate Functions, Clauses	
		44

References/Text Books:

1. Henry korth and A. Silberschatz, Database System Concepts, Mc Graw Hill
2. Bipin Desai, An Introduction to Database Systems, Galgotia
3. Michael J. Folk, Greg, Riccardi, File Structure, Pearson Education

Operating System (BCA-125)

Discipline Core (DC); 4 Credits (3-0-2)

Objectives:

This course provides a comprehensive introduction to understand the underlying principles, techniques and approaches which constitute a coherent body of knowledge in operating systems. In particular, the course will consider inherent functionality and processing of program execution. The emphasis of the course will be placed on understanding how the various elements that underlie operating system interact and provides services for execution of application software**.**

S. No.	Topic	No. of Lectures
Unit1	**Introduction and history of Operating systems:** Types of operating system, structure and operations, processes and files. OS services and Components, multitasking, Multiprogramming, Timesharing, Buffering, Spooling.	**4**
Unit2	**Processor management:** Process and Thread Management, Concept of process and threads, Process states, process scheduling and algorithms, threads, multithreading.	**4**
Unit3	**Concurrency Control:** Concurrency and Race Conditions, Mutual exclusion requirements, Software and hardware solutions, Semaphores, Monitors, Classical IPC problems and solutions, Deadlock: Shared resources, resource allocation and scheduling, resource graph models, deadlock detection, deadlock avoidance, deadlock prevention algorithms.	**12**
Unit4	**Memory management:** Memory partitioning, contiguous memory allocation, Swapping, virtual memory, paging, Segmentation, Virtual memory , Overlays, Demand paging, page replacement policies,	**8**

	Performance of Demand paging , thrashing, case study.	
Unit5	**Device management:** Devices and their characteristics, device drivers, device handling, Secondary-Storage Structure, Disk structure ,Disk scheduling ,Disk management ,Swap-space management , disk scheduling algorithms and policies, Disk reliability, Stable storage implementation.	**8**
Unit6	**File management:** File concept, types and structures, directory structure, cases studies, access methods and matrices, file security, user authentication.	**5**
Unit7	**Special topics in Operating system:** UNIX and Linux operating systems as case studies, Time OS and case studies of Mobile OS.	**4**
		45

Reference/Text Books:

1. Operating Systems Design and implementation Andrew S. Tanenbam, Albert S. Woodhull Pearson
2. Operating System Concepts (7th Ed) by silberschatz and Galvin, Wiley, 2000.
3. Operating Systems (5th Ed) - Internals and Design Principles by William Stallings, Prentice Hall, 2000 4.Unix Shell Programming - Yashwant Kanetkar, BPB publications .